

Linear and Nonlinear Optimization

Spring 2018

Instructor: Sung-Pil Hong (sphong@snu.ac.kr)

Office hours: Upon request

Class hours: Tue/Thu 11:00 - 12:15 (Room 428, Building 38)

Language: In English but not exclusively. You can ask questions and take tests in Korean. Instructor may recapture some subtle parts in Korean.

Lecture note: Available at course homepage polytope.snu.ac.kr (시중에 나와 있는 선형계획 책 사지 말 것)

References:

경영과학 제2판, 홍성필, 을곡출판사, 2014.
Linear Programming, K. Murty.

Course Synopsis: A self-contained treatment of LP theories covering matrices, Gauss-Jordan elimination, spaces associated with a matrix, polyhedrons and their facial structure, Farkas lemma, duality, and Simplex method. Also an introduction to principles of convex optimization problem.

Evaluation:

- 5 Quizzes + 5 Take-home tests (60%)
- Final (30%)
- Participation (10+ α %)
'Stupid' questions are particularly welcome!
앞드려 자는 행위 성적 반영 (강의 홈페이지 참고)

Quizzes + Take-home tests:

- 5 25-min Quizzes on definitions and proofs covered in class.
- 5 take home test asking 1 or 2 problems due on the same night.
- TA sessions before quizzes and final (시간 별도 공지)

출석:

- 지정 좌석: 둘째 주부터는 학생들의 좌석을 지정. 3월 8일 목요일까지 증명사진 (파일) 제출할 것. 이후 3월 13일부터 출석 체크.
- 조교가 수업시작 10분 후 빈 좌석을 체크하여 결석으로 처리. 지각처리는 따로 하지 않음. 4회 이상 결석부터 1회 마다 참여(Participation) 점수 2% 감점.

A tentative schedule

Lecture	Chapter	Topics	Date
1	1. Linear Equality Systems	Matrices and their operations,	3/6(Tue)
2		Gauss-Jordan elimination, Linear Independence	3/8(Thu)
3		Spaces associated with matrix, Rank-and-nullity theorem	3/13(Tue)
4		Rank-and-nullity theorem (cont'd), Adjacent basic solutions	3/15(Thu)
5	2. Linear Inequality Systems	(Quiz I) Fourier-Motzkin elimination	3/20(Tue)
6		Farkas lemma	3/22(Thu)
7		Weak and strong duality	3/27(Tue)
8		Geometry of duality	3/29(Thu)
9		Convex sets, Affine spaces	4/3(Tue)
10		(Quiz II) Affine spaces_(cont'd), Valid inequalities, Separation hyperplanes,	4/5(Thu)
11		Polyhedra, Faces	4/10(Tue)
12		"Slow down a bit" with review.	4/12(Thu)
13		Facets	4/17(Tue)
14		Minimal faces	4/19(Thu)
15		Vertices	4/24(Tue)
16		(Quiz III) Weyl-Minkowski theorem	4/26(Thu)
17	3. Simplex Method	Basic feasible solutions	5/1(Tue)
18		Adjacent BFSs Minimum ratio test	5/3(Thu)
19		Simplex method for canonical LPs	5/8(Tue)
20		Two phase method for standard LPs	5/10(Thu)
21	4. Nonlinear Programs	Gradient vectors, Chain rule, Descent directions	5/15(Tue)
22		KKT necessary condition,	5/15(Tue) Evening
23		(Quiz IV) Convex optimization,	5/17(Thu)
24		First and second order conditions of convexity	5/24(Thu)
25		Feasible direction theorem, KKT-sufficient condition,	5/29(Tue)
26		Applications	5/31(Thu)
27		First and Second order algorithms	6/5(Tue)
28		(Quiz V) Feasible direction methods	6/7(Thu)
29		Barrier method I	6/12(Tue)
30		Review	6/14(Thu)
Final		6:00 pm	6/15(Fri)